



**N-type i-TOPCon Bifacial Dual Glass**  
MONOCRYSTALLINE MODULE

PRODUCT:TSM-XXXNEG9RC.27

POWER RANGE: 415-445W

**445W**

MAXIMUM POWER OUTPUT

**0~+5W**

BINNING TOLERANCE

**22.3%**

MAXIMUM EFFICIENCY

25 Years **PRODUCT WARRANTY**  
30 Years **POWER WARRANTY**



**Small in size, bigger on power**

- Up to 445W,22.3% module efficiency with high density interconnect technology
- Reduce installation cost with higher power bin and efficiency
- Boost performance in warm weather with low temperature coefficient and operating temperature



**Transparent Dual-glass Design**

- Transparent design with aesthetics appearance,3.2% transparency
- Upgraded dual glass of Vertex S, less prone to micro-cracks and scratches on the back during installation
- Fire Class rating C



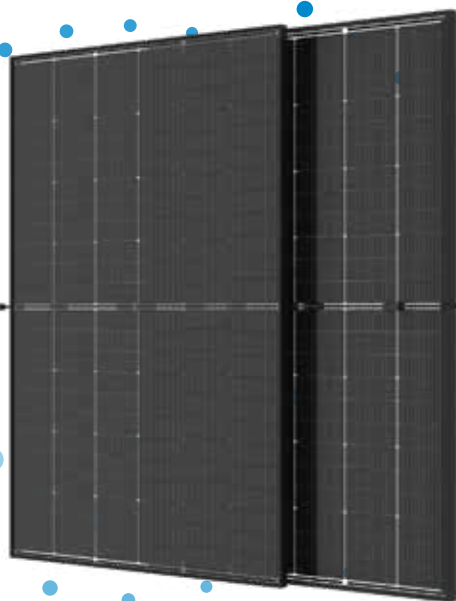
**Ultra-low Degradation, longer warranty, higher output**

- First-year degradation 1% and annual degradation at 0.4%
- Up to 25 years product warranty and 30 years power warranty

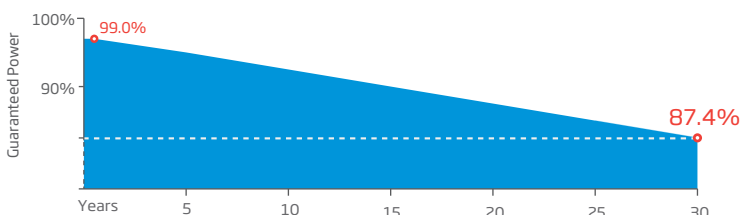


**Universal solution for residential and C&I rooftops**

- Easy for integration, designed for compatibility with existing mainstream inverters and diverse mounting systems
- Perfect size and low weight for handling and installation
- Most valuable solution on low load capacity rooftops (weight similar to backsheet version)
- Mechanical performance up to 5400 Pa positive load and 4000 Pa negative load



**Trina Solar's Vertex Bifacial Dual Glass Performance Warranty**



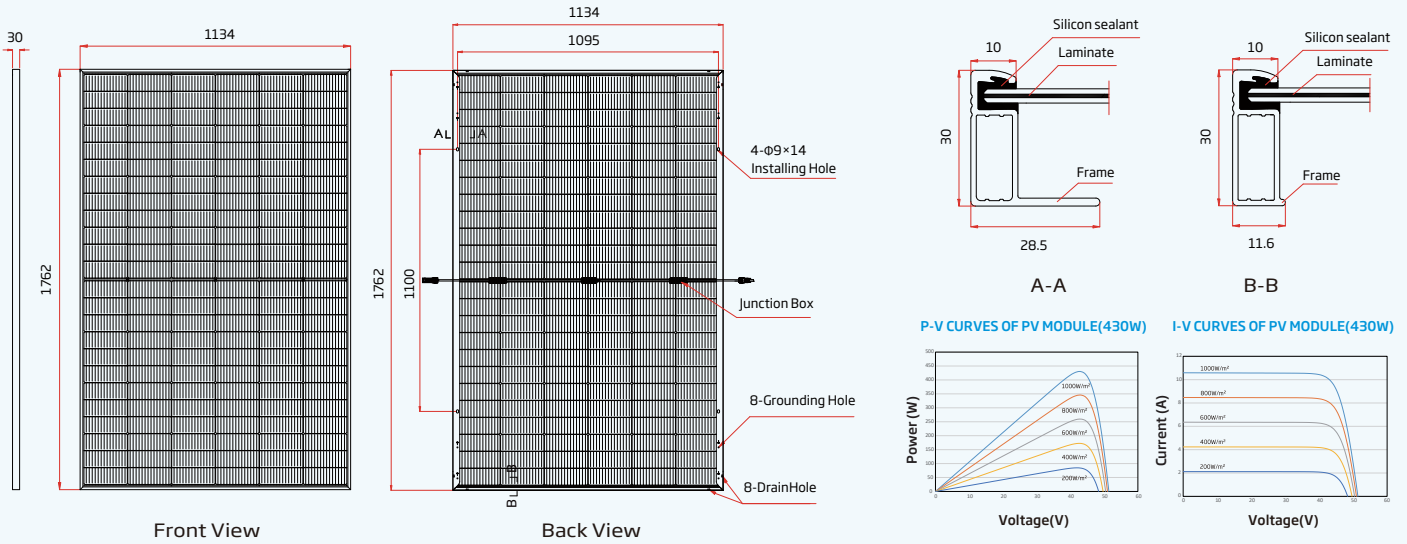
**Comprehensive Products and System Certificates**



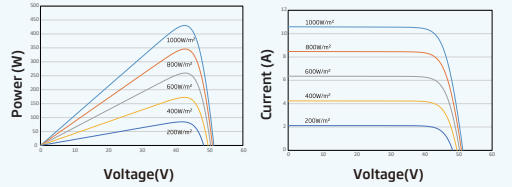
IEC61215/IEC61730  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO14064: Greenhouse Gases Emissions Verification  
ISO45001: Occupational Health and Safety Management System



**DIMENSIONS OF PV MODULE(mm)**



**P-V CURVES OF PV MODULE(430W) I-V CURVES OF PV MODULE(430W)**



**MECHANICAL DATA**

Solar Cells	N -type Monocrystalline
No. of cells	144cells
Module Dimensions	1762×1134×30 mm (69.06×43.15×1.18 inches)
Weight	21.0kg (46.30 lb)
Front Glass	1.6 mm (0.06 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	1.6 mm (0.06 inches), High Transmission, Heat Strengthened Glass

Frame	30mm (1.18 inches) Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ) Length: 1100mm/1100mm(43.3/43.3 inches)
Connector	Stabuli MC4 EVO2

**ELECTRICAL DATA (STC & NOCT&BNPI) TSM-XXXNEG9RC.27(XXX=415-445)**

Testing Condition	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	
Peak Power Watts-P <sub>MAX</sub> (Wp)*	415	317	460	420	321	465	425	325	471	430	328	476	435	332	482	440	336	488	445	338	493	
Binning Tolerance-P <sub>MAX</sub> (W)	0 ~ +5																					
Maximum Power Voltage-V <sub>MPP</sub> (V)	42.1	39.3	42.1	42.5	39.7	42.5	42.9	40.0	42.9	43.2	40.4	43.2	43.6	40.7	43.6	44.0	41.0	44.0	44.3	41.3	44.3	
Maximum Power Current-I <sub>MPP</sub> (A)	9.86	8.03	10.92	9.89	8.07	10.95	9.92	8.09	10.98	9.96	8.11	11.03	9.99	8.15	11.05	10.01	8.17	11.08	10.05	8.20	11.13	
Open Circuit Voltage-V <sub>OC</sub> (V)	50.1	47.6	50.1	50.5	47.9	50.5	50.9	48.3	50.9	51.4	48.8	51.4	51.8	49.2	51.8	52.2	49.5	52.2	52.6	49.9	52.6	
Short Circuit Current-I <sub>SC</sub> (A)	10.50	8.46	11.63	10.53	8.49	11.67	10.56	8.51	11.70	10.59	8.53	11.73	10.64	8.57	11.79	10.67	8.60	11.82	10.71	8.63	11.87	
Module Efficiency η <sub>m</sub> (%)	20.8		21.0		21.3		21.5		21.8		22.0		22.3									

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5. NOCT: Irradiance at 800W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 1m/s. BNPI: Irradiance at 1000W/m<sup>2</sup> × 0.135W/m<sup>2</sup>, Air Mass AM1.5, Temp 25°C \*Measuring tolerance: ±3%.

**Electrical characteristics with different power bin (reference to 5% & 10% backside power gain)**

Backside Power Gain	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	
Total Equivalent power -P <sub>MAX</sub> (Wp)	436	457	441	462	446	468	452	473	457	479	462	484	467	490					
Maximum Power Voltage-V <sub>MPP</sub> (V)	42.1	42.1	42.5	42.5	42.9	42.9	43.2	43.2	43.6	43.6	44.0	44.0	44.3	44.3					
Maximum Power Current-I <sub>MPP</sub> (A)	10.35	10.85	10.38	10.88	10.42	10.91	10.46	10.96	10.49	10.99	10.51	11.01	10.55	11.06					
Open Circuit Voltage-V <sub>OC</sub> (V)	50.1	50.1	50.5	50.5	50.9	50.9	51.4	51.4	51.8	51.8	52.2	52.2	52.6	52.6					
Short Circuit Current-I <sub>SC</sub> (A)	11.03	11.55	11.06	11.58	11.09	11.62	11.12	11.65	11.17	11.70	11.20	11.74	11.25	11.78					

Power Bifaciality: 80±7%; η<sub>p</sub> P<sub>max</sub>: 80%±7%; η<sub>p</sub> V<sub>oc</sub>: 100%±3%; η<sub>p</sub> I<sub>sc</sub>: 80%±7%

**TEMPERATURE RATINGS**

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P <sub>MAX</sub>	-0.29%/°C
Temperature Coefficient of V <sub>OC</sub>	-0.24%/°C
Temperature Coefficient of I <sub>SC</sub>	0.04%/°C

**MAXIMUM RATINGS**

Operational Temperature	-40~+70 °C
Maximum System Voltage	1500V DC (IEC)
Max Series Fuse Rating	25A

**WARRANTY**

25 year Product Workmanship Warranty\*\*  
30 year Power Warranty  
1% first year degradation\*  
0.4% Annual Power Attenuation\*

(\*\*Please refer to Limited Warranty Supplement that applies to the TSM-\*\*\*NEG9R.28, TSM-\*\*\*NEG9R.27, Products supplied after 1st Jan 2023 and installed within Australia & New Zealand rooftop market.)  
(\*Power degradation values above apply to frontside, refer to product warranty for power degradation for backside and other details)

**PACKAGING CONFIGURATION**

Modules per box: 36 pieces  
Modules per 40' container: 936 pieces